TECHNICAL MANUAL

SERVICE

KWM-2A TRANSCEIVER
30L-1 RF LINEAR POWER AMPLIFIER
30S-1 RF LINEAR POWER AMPLIFIER

AND ACCESSORY EQUIPMENT

COLLINS

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LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

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Table 1-1. Leading Particulars

EQUIPMENT	SIZE (in)			WEIGHT (lb)	POWER	
	W	H	D		TYPE	REQUIREMENT (max)
KWM-2A Transceiver	14-3/4	7-3/4	13-1/4	18	Refer to PM-2, 516F-2, or MP-1 Power Supply.	
30L-1 RF Linear Power Amplifier	14-3/4	7-3/4	13-1/4	38	115/230 volts, 50 to 60 Hz, single-phase	1200 watts
30S-1 RF Linear Power Amplifier	17	30-5/8	16-3/4	165	115/230 volts, 50 to 60 Hz, single-phase (230 volts is 3-wire)	1400 watts
PM-2 Power Supply	14-3/4	7-3/4	4	15	115/230 volts, 50 to 60 or 400 Hz, single-phase	320 watts
MP-1 Power Supply	5-1/16	3-11/16	11	8	12 volts dc	320 watts
516F-2 Power Supply	9-7/8	7-3/4	11-1/2	30	115/230 volts, 50 to 60 Hz, 4 A or 2 A	500 watts
440E-1 Cable	Length = 19 feet			3		
CP-1 Crystal Packet	6	2	18	3		
MM-1 Microphone	2	3	2	2		
312B-4 Station Control	10	7-3/4	12-1/4	9		
302C-3 Directional RF Wattmeter	3	3-1/2	6-1/2	2		
TD-1 Antenna	9	5	5	4		
180S-1 Antenna Tuner	12	7-1/2	12	10		
DL-1 Dummy Load	5-11/16	3-1/2	7-5/16	2-7/8	6.3 Vac, 50 to 60 Hz	
350D-3 Mount	12	4	12	3		
351D-2 Mount	15	8	12	16		
351E-4 Mount	15	1	14	3		
351E-2 Mount	10	1	12-1/2	2		
CC-2 Carrying Case	21-1/2	20	9-1/2	10		
CC-3 Carrying Case	21-1/2	20	9-1/2	10		

Table 1-2. Capabilities and Limitations (Sheet 1 of 6)

KWM-2A TRANSCEIVER	
Environmental limitations	
Temperature	0 to +50 °C (+32 to +122 °F)
Humidity	0 to 95 percent
Altitude	0 to 10,000 feet
Shock and vibration	Normal handling and transportation
Frequency capabilities	
Range	3.4 to 30.0 MHz (except 5.0 to 6.6 MHz) using proper crystals
	Supplied with crystals for 3.4 to 4.0 MHz 7.0 to 7.4 MHz 14.0 to 14.4 MHz 14.8 to 15.0 MHz 21.0 to 21.6 MHz 28.5 to 28.7 MHz
Stability	±100 Hz after warmup
Calibration accuracy	1 kHz
Receive capabilities	
Types of emission	LSB, USB, CW
Rf input impedance	50 ohms
Sensitivity	0.5 microvolt for 10-dB signal-plus-noise to noise ratio in amateur bands
Selectivity	2.1 kHz at 6 dB down 5.3 kHz at 60 dB down
Spurious responses	Image rejection more than 40 dB. Internal spurious signals below 1-microvolt equivalent antenna input
Demodulation method	Product detector
Audio frequency response	300 to 2400 Hz ±6 dB
Audio output impedance	4 or 500 ohms
Audio output power	1.0 watt minimum
Audio distortion	5 percent maximum
Transmit capabilities	
Types of emission	LSB, USB, CW

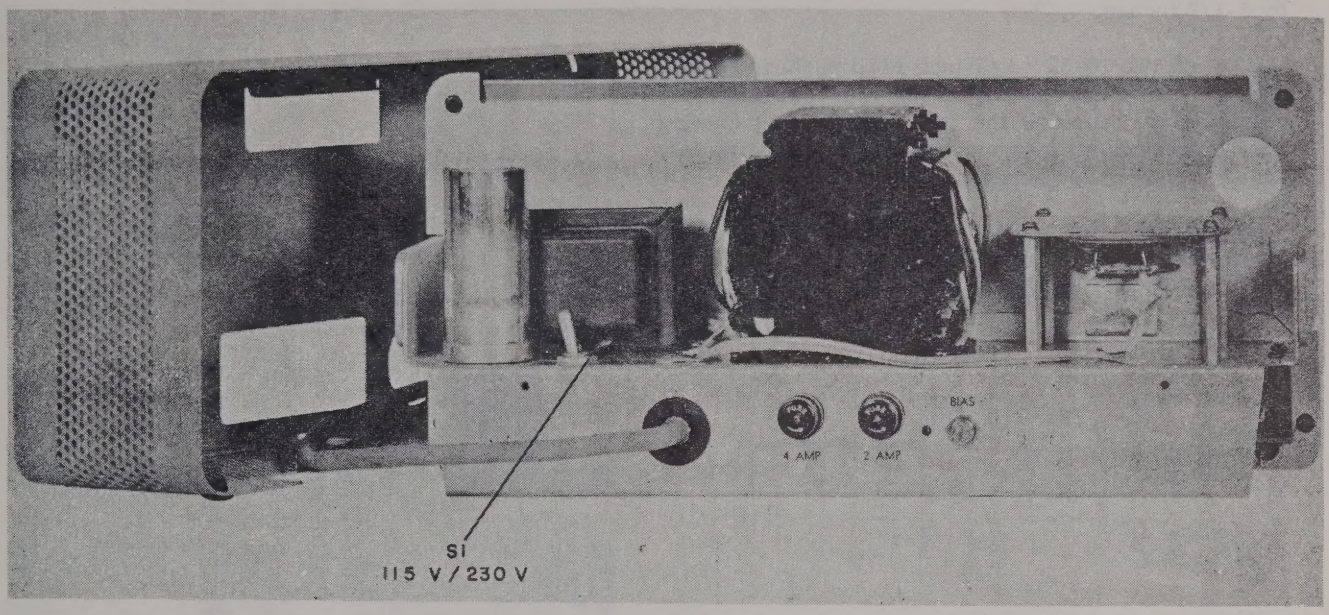

Figure 2-5. PM-2 Power Supply, Switch Location

2-33. DL-1 DUMMY LOAD.

2-34. If the DL-1 is mounted in a rack frame or on a chassis, remove the four rubber feet and secure it with four 6-32 screws. Ground the unit by inserting a grounding screw in the tapped hole in the bottom of the case. Refer to figure 20 in the circuit diagrams technical manual.

2-35. TD-1 ANTENNA.

NOTE

This antenna is not designed to be used either during windy conditions of over 5 MPH or left unattended on a permanent basis. Replace with other suitable antenna for extended use or during windy conditions.

a. Refer to the frequency versus length chart on the side of the TD-1. Determine the length (in meters) corresponding to the desired operating frequency. Interpolate for frequencies between those listed.

b. Loosen the tape clamps (figure 2-7) and extend each half of the antenna to the length determined in the preceding step. The antenna tapes are calibrated in meters. Tighten the tape clamps.

c. Choose a site for the antenna. The antenna should be placed as high as possible, free from surrounding obstructions, and as nearly horizontal as possible.

d. Connect the transmission line supplied with the TD-1 to the coaxial connector at the bottom of the main body of the antenna.

e. Secure the antenna at the selected site. Support the middle of the antenna with cord or wire through the hole in the antenna body. Support the ends with the cords attached to the ends of the tapes.

f. When the antenna is taken down, loosen the tape clamps and wind in the tapes using the rewind cranks (figure 2-7).

2-36. 350D-3 MOUNT.

2-37. Secure the 350D-3 to the desired mounting surface using #6 wood screws or #6 machine screws and nuts. Use lockwashers under the nuts. Position the 350D-3 in the installation to place the 180S-1 Antenna Tuner as near the antenna feedpoint as possible.

2-38. 351D-2 MOUNT.

2-39. The 351D-2 Mount is shipped assembled except for wiring. Before installing the 351D-2 in a vehicle, disassemble it into the parts shown in figure 2-8. During disassembly, note the types and locations of the various pieces of hardware so that they will be replaced correctly during the assembly procedure.

a. Cut a rectangular cardboard template 13 inches by 6-1/2 inches.

b. Start two 10-32 x 1/2-inch Phillips-head screws through split lockwashers, through the two holes in the clamping bar, through the two holes in the mounting hook on the mounting frame, and into the base bracket. Do not tighten these screws.

c. Arrange this partial assembly in the desired mounting position in the vehicle. Mark the position of the base bracket with chalk.

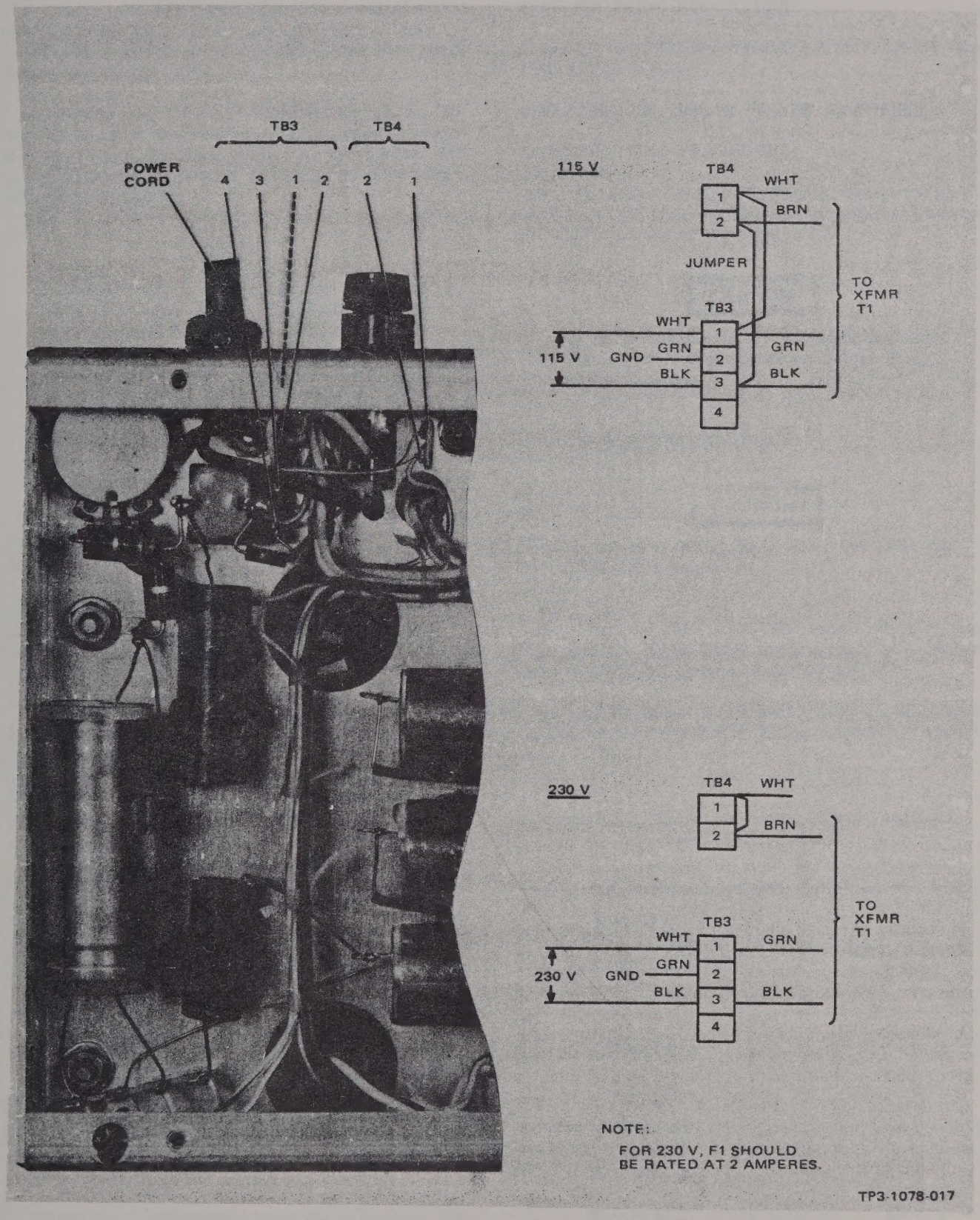

Figure 2-6. 516F-2 Power Supply, Power Transformer Connections

h. Adjust the VOX TIME CONSTANT control so that the VOX relay hold-in time is long enough to keep the VOX relays energized during pauses between words during normal operation.

i. Return the OFF-ON-NB-CAL switch to ON. The KWM-2A is now ready for SSB receive or transmit operation. Speaking into the microphone will energize the VOX relays to switch the KWM-2A from receive to transmit.

NOTE

If push-to-talk operation is desired, set the VOX GAIN and ANTI VOX GAIN controls fully counterclockwise, and use the microphone push-to-talk switch to switch from receive to transmit. Push-to-talk operation is recommended during operation in areas where high-level background noise causes undesirable VOX switching.

3-14. CW OPERATION.

a. Perform the KWM-2A tuning procedures in paragraphs 3-11 and 3-12.

NOTE

Set the VFO tuning dial 1.5 kHz below the desired CW operating frequency.

b. Set the EMISSION switch to CW.

c. Connect the CW key to the KEY jack at the rear of the KWM-2A.

d. Close the CW key, and adjust the A.F. GAIN control for a comfortable CW sidetone level.

e. Set the KWM-2A multimeter selector to ALC. While sending a series of dots, adjust the MIC GAIN control for a multimeter indication of S2.

f. Set the VOX GAIN, ANTI VOX GAIN, and VOX TIME CONSTANT controls fully counterclockwise.

g. Close the CW key. Turn the VOX GAIN control clockwise until the VOX relays energize.

h. Adjust the VOX TIME CONSTANT control so that the VOX relay hold-in time is great enough to keep the VOX relays from switching during spaces between words at normal keying speed. Turning the VOX TIME CONSTANT control clockwise increases the hold-in time.

i. During CW reception, leave the A.F. GAIN control set at the position that gives comfortable sidetone level during transmit. Adjust the receive audio level with the R.F. GAIN control. The received signal level is indicated on the multimeter S-unit scale.

3-15. STOPPING PROCEDURE.

3-16. To turn off the KWM-2A, set the OFF-ON-NB-CAL switch to OFF.

3-17. 30L-1 RF LINEAR POWER AMPLIFIER.

3-18. STARTING PROCEDURE.

3-19. To turn on the 30L-1 RF Linear Power Amplifier, set the ON-OFF switch to ON. Allow a sufficient warm-up period before applying excitation to 30L-1.

CAUTION

Be sure that the 30L-1 rf output is loaded with approximately 50 ohms before turning on the amplifier.

3-20. TUNING PROCEDURE.

CAUTION

Do not turn 30L-1 to OFF or ON while the KWM-2A is keyed.

a. With the 30L-1 ON-OFF switch at OFF, tune and load the KWM-2A as in paragraph 3-12. Return MIC GAIN to full counterclockwise position.

b. Set the 30L-1 BAND switch to the position determined by the KWM-2A operating frequency. Refer to table 3-13.

Table 3-13. 30L-1 RF Linear Power Amplifier Band-Switch Settings

KWM-2A OPERATING FREQUENCY (MHz)	30L-1 BAND-SWITCH SETTING
3.4 to 5.0	3.5
6.6 to 9.5	7.0
9.5 to 16.0	14
16.0 to 22.0	21
22.0 to 30.0	28

CAUTION

If the KWM-2A operating frequency is more than several kHz outside an amateur band, readjust the 30L-1 rf input tuned circuits as in maintenance procedures, paragraph 5-23.

c. Set the TUNING control to the approximate KWM-2A operating frequency.

d. Set the LOADING control to 1.

e. Set the METER switch to TUNE.

f. Press the 30L-1 ON-OFF switch to ON.

g. Set the EMISSION switch to TUNE position and increase MIC GAIN to 3 o'clock position (refer to paragraph 3-20a). Plate current should be 200 mA.

h. Immediately adjust the 30L-1 TUNING control for meter dip. Then adjust the LOADING control for meter zero. Alternately readjust the TUNING and LOADING controls until the meter indication is zero at the dip. Always make the TUNING control adjustment the last adjustment.

CAUTION

Do not operate the 30L-1 into a load with an swr of greater than 2:1.

Do not operate the 30L-1 in continuous key-down condition at full power output for more than 30 seconds at one time.

Do not use the 30L-1 for FSK, AM, or FM type emissions.

i. Set the EMISSION switch to the desired mode of operation and perform operating procedures in paragraph 3.13 for SSB or 3.14 for CW.

3-21. STOPPING PROCEDURE.

3-22. To turn off the 30L-1 RF Linear Power Amplifier, set the ON-OFF switch to OFF.

3-23. 30S-1 RF LINEAR POWER AMPLIFIER.

3-24. STARTING PROCEDURE.

3-25. To turn on the 30S-1 RF Linear Power Amplifier, set the POWER-OFF switch to POWER.

CAUTION

Be sure that the 30S-1 rf output is loaded with approximately 50 ohms before turning on the amplifier.

3-26. TUNING PROCEDURE.

a. With the POWER-OFF switch set to POWER, tune and load the KWM-2A as in paragraph 3-12. Return MIC GAIN to full counterclockwise position.

b. Set the multimeter selector switch to TUNING & LOADING.

c. Set the BANDSWITCH control to the position determined by the KWM-2A operating frequency. Refer to table 3-14.

Table 3-14. 30S-1 RF Linear Power Amplifier, Band-Switch Settings

KWM-2A OPERATING FREQUENCY (MHz)	30S-1 BAND-SWITCH SETTING
3.4 to 5.0	3.5
6.6 to 10.0	7
10.0 to 15.0	14
15.0 to 22.0	21
22.0 to 30.0	28

CAUTION

If the KWM-2A operating frequency is more than several kHz outside an amateur band, readjust the 30S-1 rf input tuned circuits as in maintenance procedures, paragraph 5-28.

Be sure the 30S-1 plate voltage is off when changing position of the SSB-CW switch.

d. Set the SSB-CW switch to the desired emission type.

e. Set the TUNING control to the approximate KWM-2A operating frequency using the frequency scale on the dial. Set the LOADING control to 0.

NOTE

A built-in time delay prevents application of high voltage for 3 minutes after the POWER-OFF switch is set to POWER.

CHAPTER 5
MAINTENANCE

5-1. INTRODUCTION.

5-2. This chapter contains maintenance information for the equipment covered by this technical manual. The maintenance procedures are divided into two sections: section I gives organizational/field maintenance, and section II contains special maintenance to be performed at a repair depot.

SECTION I
ORGANIZATIONAL/FIELD MAINTENANCE

5-3. TEST EQUIPMENT REQUIRED.

5-4. The test equipment required to perform the maintenance procedures given in this section is listed in table 5-1.

5-5. Two special pieces of test equipment that must be constructed to aid in the performance of maintenance procedures in this section are shown in figures 5-1 and 5-2.

5-6. PREVENTIVE MAINTENANCE.

5-7. Refer to the preventive maintenance workcards, TO 31R2-4-183-WC-6, for preventive maintenance routines for the equipment covered by this technical manual.

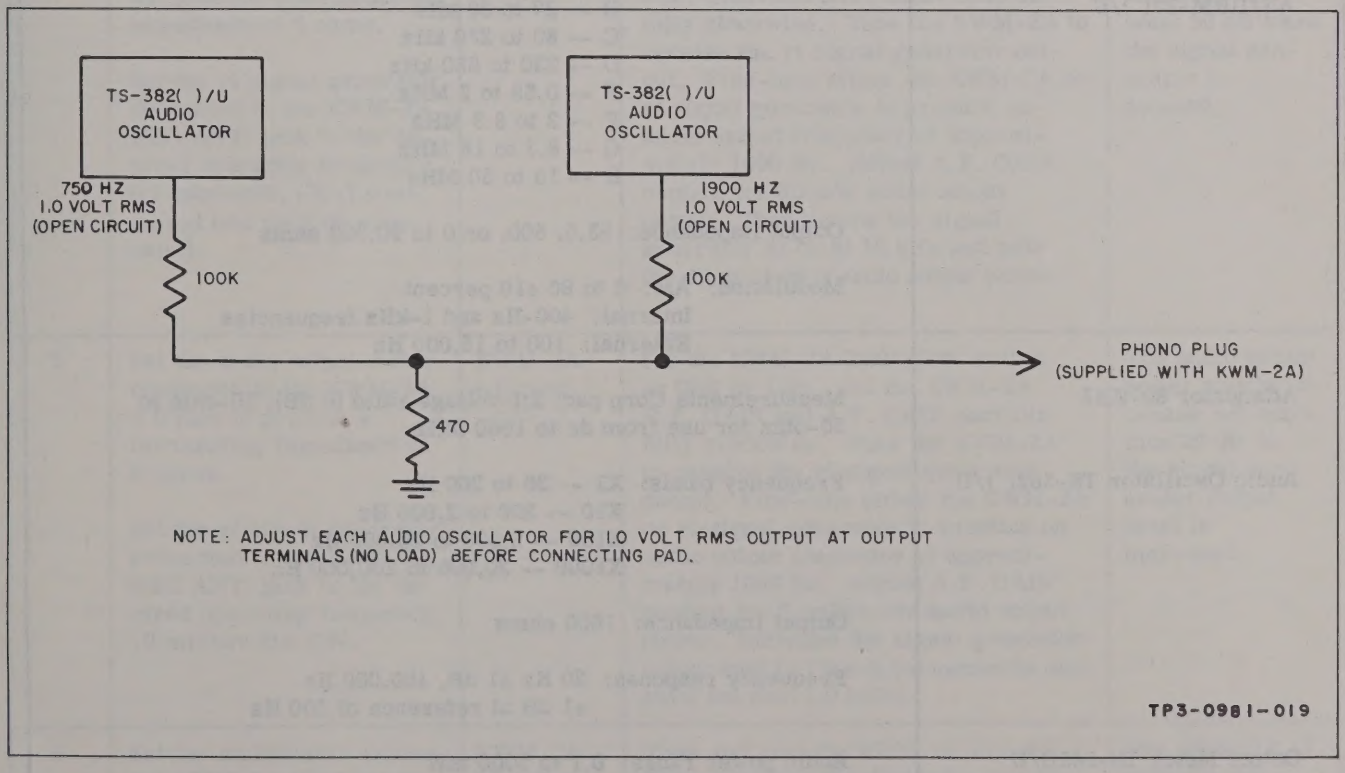

Figure 5-1. 2-Tone Generator, Schematic Diagram

Table 5-1. Test Equipment Required

TEST EQUIPMENT	CHARACTERISTIC
Multitester ME-26A/U	Voltage range: 0 to 300 volts ac in six scales 0 to 1000 volts dc in seven scales Ohmmeter range: 0.2 to 500 megohms in seven ranges Frequency range: 20 Hz to 700 MHz Accuracy ±3 percent
Probe Connector 455A	Capable of converting ME-26A/U to rf indicating meter
Dummy Load 82C	Impedance: 52 ohms, resistive Power handling capabilities: 1000 watts
Receiver R-390A/URR (or HF Frequency Meter)	Frequency range: 0.5 to 32 MHz Signals received: CW, SSB, AM Tuning: continuous; frequency read directly on counter indicator Calibration: Crystal controlled, every 100 kHz Selectivity: 0.1- to 16.0-kHz bandwidth in six steps
RF Signal Generator AN/URM-25( )/U	Frequency bands: A -- 10 to 27 kHz B -- 27 to 80 kHz C -- 80 to 230 kHz D -- 230 to 680 kHz E -- 0.68 to 2 MHz F -- 2 to 8.3 MHz G -- 8.3 to 18 MHz H -- 18 to 50 MHz Output impedance: 53.5, 500, or 0 to 90,000 ohms Modulation: AM: 0 to 80 ±10 percent Internal: 400-Hz and 1-kHz frequencies External: 100 to 15,000 Hz
Attenuator 80-ZH3	Measurements Corp pad, 2:1 voltage ratio (6 dB), 50-ohm to 50-ohm for use from dc to 1000 MHz.
Audio Oscillator TS-382( )/U	Frequency bands: X1 -- 20 to 200 Hz X10 -- 200 to 2,000 Hz X100 -- 2,000 to 20,000 Hz X1000 -- 20,000 to 200,000 Hz Output impedance: 1000 ohms Frequency response: 20 Hz ±1 dB, 150,000 Hz ±1 dB at reference of 300 Hz
Output Meter TS-585B/U	Audio power range: 0.1 to 5000 mW Impedance range: 2.5 to 20,000 ohms

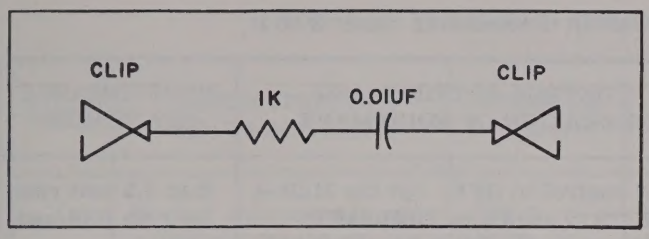

Figure 5-2. Swamping Tool, Schematic Diagram

5-8. PERFORMANCE TEST STANDARDS.

5-9. Refer to performance test tables, tables 5-2 through 5-4, for performance test procedures and standards for the equipment covered by this technical manual.

5-10. Figures 5-3 and 5-9 show the equipment setups that are to be used when performing the performance tests.

Table 5-2. Performance Test for KWM-2A Transceiver (Sheet 1 of 2)

STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	CONTROL SETTINGS AND OPERATION OF EQUIPMENT	PERFORMANCE STANDARDS
1	Set the audio output meter connected to the KWM-2A 4 Ω jack to provide a terminating impedance of 4 ohms. Set the rf signal generator connected to the KWM-2A REC ANT. jack to the desired operating frequency, 2.5 microvolts, CW.	KWM-2A 4 Ω jack	Set the KWM-2A EMISSION switch to USB or LSB. Set the KWM-2A R.F. GAIN and A.F. GAIN controls fully clockwise. Tune the KWM-2A to receive the rf signal generator output. Fine tune either the KWM-2A or rf signal generator to produce an audio output frequency of approximately 1000 Hz.	The audio output power at the KWM-2A 4 Ω jack should be 1.0 watt minimum.
2	Set the audio output meter connected to the KWM-2A 4 Ω jack for a terminating impedance of 4 ohms. Set the rf signal generator connected to the KWM-2A REC ANT. jack to the desired operating frequency, 0.5 microvolts, CW (1.0 microvolt into the 6 db attenuator).	KWM-2A 4 Ω jack	Set the KWM-2A EMISSION switch to USB or LSB. Set the KWM-2A R.F. GAIN and A.F. GAIN controls fully clockwise. Tune the KWM-2A to receive the rf signal generator output. Fine-tune either the KWM-2A or rf signal generator to produce an audio output frequency of approximately 1000 Hz. Adjust A.F. GAIN control for 50 mW audio output power. Then detune the signal generator at least 10 kHz and note the dB decrease in audio output power.	The audio output power should decrease at least 10 dB when the signal generator is detuned.
3	Set the audio output meter connected to the KWM-2A 4 Ω jack to provide a terminating impedance of 4 ohms. Set the rf signal generator connected to the KWM-2A REC ANT. jack to the desired operating frequency, 10 microvolts, CW.	KWM-2A 4 Ω jack	Set the KWM-2A EMISSION switch to USB or LSB. Set the KWM-2A R.F. GAIN and A.F. GAIN controls fully clockwise. Tune the KWM-2A to receive the rf signal generator output. Fine-tune either the KWM-2A or rf signal generator to produce an audio output frequency of approximately 1000 Hz. Adjust A.F. GAIN control for 5 milliwatts audio output power. Increase the signal generator output level to 1.0 volt (or maximum output if less than 1.0 volts).	The audio output power should increase not more than 20 dB as the signal generator output level is increased.
4 (Cont)	Set the multitester across the KWM-2A rf output to its lowest scale after	KWM-2A rf output	Tune and load the KWM-2A into the dummy load at the desired operating frequency. Set the KWM-2A MIC	The KWM-2A rf output voltage shall be less

Table 5-2. Performance Test for KWM-2A Transceiver (Sheet 2 of 2)

STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	CONTROL SETTINGS AND OPERATION OF EQUIPMENT	PERFORMANCE STANDARDS
4 (Cont)	tuning and loading the KWM-2A.		GAIN control to OFF. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY. Note the KWM-2A rf output voltage with the KWM-2A EMISSION switch set to both USB and LSB. **CAUTION** Do not keep the KWM-2A above 230 mA plate current for more than 30 seconds at one time.	than 0.2 volt rms for both USB and LSB.
5	Set the multitester across the KWM-2A rf output to its 300-volt scale. Set the 312B-4 wattmeter selector to FORWARD, 200.	312B-4 wattmeter	Tune and load the KWM-2A into the dummy load at the desired operating frequency. Load to 230 mA plate current. Set the KWM-2A PLATE-GRID-ALC control to GRID. Set the EMISSION switch to LOCK. Adjust the MIC GAIN control until the multimeter indicates S2. Note the 312B-4 wattmeter indication.	The 312B-4 wattmeter shall indicate 80 watts minimum.

Table 5-3. Performance Test for 30L-1 RF Linear Power Amplifier

STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	CONTROL SETTINGS AND OPERATION OF EQUIPMENT	PERFORMANCE STANDARDS
1	No test equipment is required for this step.	30L-1 multimeter	Set up the KWM-2A and 30L-1 for USB or LSB operation at 3.900 MHz. Set the KWM-2A MIC GAIN control to OFF. Set the 30L-1 METER switch to D.C. AMPS. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY. **CAUTION** Do not keep the 30L-1 at maximum output power for more than 30 seconds at one time.	The 30L-1 multimeter indicates 100 to 125 mA.
2	Set the multitester across the 30L-1 rf output to the 500-volt scale (figure 5-9).	30L-1 rf output	Set up the KWM-2A and 30L-1 for USB or LSB operation. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY. Set the KWM-2A PLATE-GRID-ALC control to ALC. Adjust the KWM-2A MIC GAIN control until the KWM-2A multimeter indicates S6.	The 30L-1 rf output voltage is 160 volts rms minimum.

Table 5-4. Performance Test for 30S-1 RF Linear Power Amplifier

STEP	OPERATION OF TEST EQUIPMENT	POINT OF TEST	CONTROL SETTINGS AND OPERATION OF EQUIPMENT	PERFORMANCE STANDARDS
1	No test equipment is required for this step.	30S-1 MULTIMETER	Set the 30S-1 POWER-OFF switch to POWER. Set the 30S-1 multimeter selector switch to FILAMENT VOLTAGE.	The 30S-1 MULTIMETER indicates 5.9 to 6.1 volts ac.
2	No test equipment is required for this step.	30S-1 PLATE CURRENT meter	Set up the KWM-2A and 30S-1 for USB or LSB operation at the desired operating frequency. Set the KWM-2A MIC GAIN control to OFF. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY. **CAUTION** Do not keep the 30S-1 at full power output for more than 30 seconds at one time.	The 30S-1 PLATE CURRENT meter indicates 0.19 to 0.21 ampere dc.
3	Set the multitester across the 30S-1 rf output to the 1000-volt scale (figure 5-9).	30S-1 rf output	Set up the KWM-2A and 30S-1 for USB or LSB operation at the desired operating frequency. Set the KWM-2A PLATE-GRID-ALC control to ALC. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY. Adjust the KWM-2A MIC GAIN control until the KWM-2A multimeter indicates S6.	The 30S-1 rf output voltage is 228 volts rms minimum.
4	Set the multitester across the 30S-1 rf output to the 1000-volt scale.	30S-1 rf output	Set up the KWM-2A and 30S-1 for CW operation at the desired operating frequency. Set the KWM-2A PLATE-GRID-ALC control to ALC. Send a series of dots using the telegraph key, and adjust the KWM-2A MIC GAIN control until the KWM-2A multimeter indicates S6. Hold telegraph key on and observe 30S-1 rf output voltage.	The 30S-1 rf output voltage is 173 volts rms minimum.

5-11. ALIGNMENT.

5-12. The following paragraphs contain alignment procedures for the equipment covered in this technical manual. Use the equipment setups shown in figures 5-3 and 5-9 when performing these alignment procedures.

5-13. KWM-2A TRANSCEIVER STATIC PLATE CURRENT ADJUSTMENT.

a. Tune and load the KWM-2A at any operating frequency. Load to 230 mA plate current.

b. Set the MIC GAIN control to OFF.

c. Set the PLATE-GRID-ALC control to PLATE.

d. Set the EMISSION switch to LOCK.

e. Note the multimeter indication. It should be 40 mA. If it is not, adjust the power supply bias adjustment (R8 or R11, figure 5-4; or R9, figure 5-5) for the proper indication.

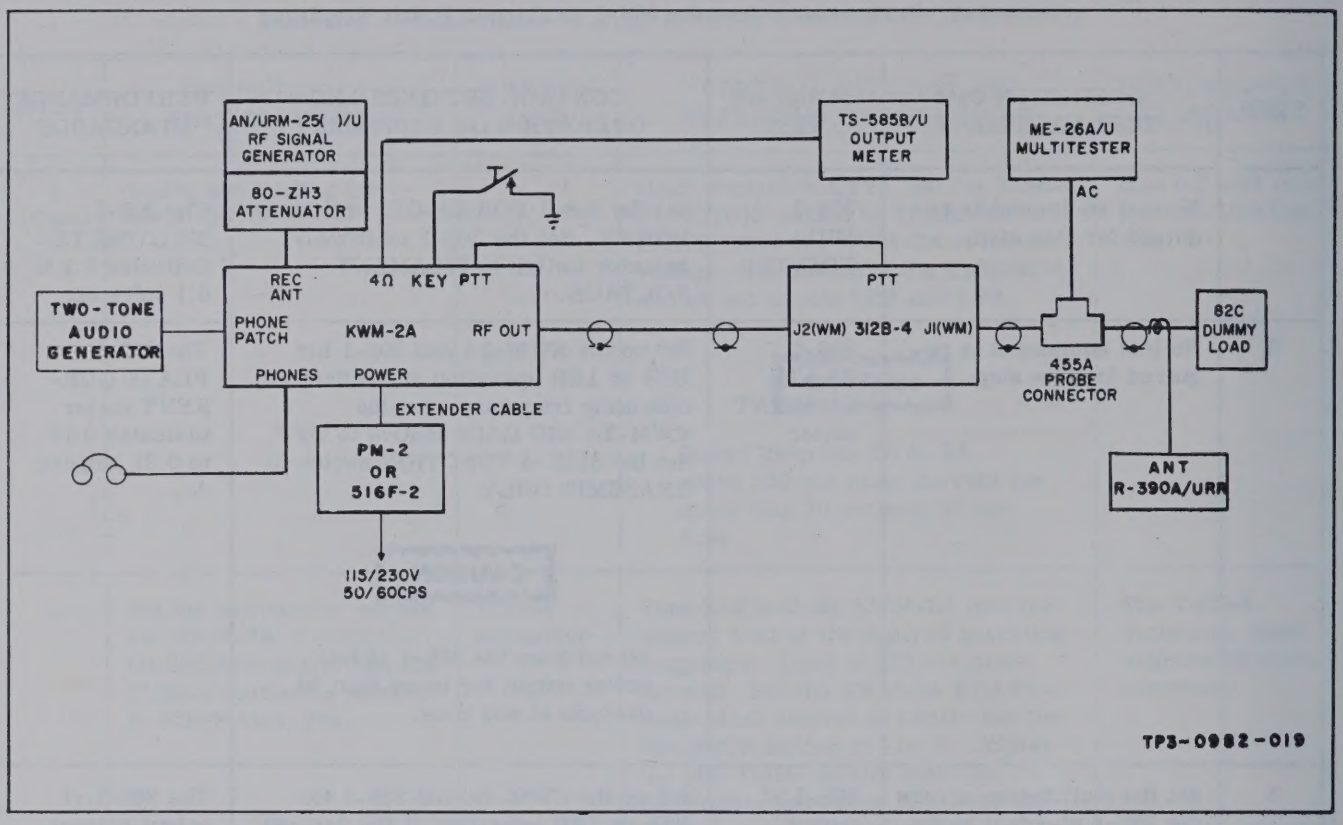

Figure 5-3. KWM-2A Transceiver, Test Setup

NOTE

If the transceiver is to be used with a linear amplifier, set the bias to produce an idling plate current of 50 mA.

5-14. KWM-2A TRANSCEIVER CARRIER BALANCE ADJUSTMENT.

a. Tune and load the KWM-2A at 3.700 MHz. Load to 230 mA plate current.

b. Set the MIC GAIN control to OFF.

c. Set the EMISSION switch to LSB.

d. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY.

e. Note the KWM-2A rf output voltage. It should be less than 0.2 volt rms. If it is not, adjust the CARRIER BAL adjustments (R15 and C9, figure 5-6) to null the rf output voltage.

NOTE

R15 and C9 interact, so adjust first one, then the other, until neither adjustment causes a further null.

f. Set the EMISSION switch to USB and repeat the preceding step. If necessary, readjust R15 and C9 until the rf output voltage at the null is approximately the same (but less than 0.2 volt rms) in both USB and LSB.

NOTE

If the voltage is not less than 0.2 volt rms, refer to paragraph 5-38 and test-select C10.

5-15. KWM-2A TRANSCEIVER TRANSMIT 455-kHz IF CIRCUIT AND BANDPASS IF ALIGNMENT. (Test setup figure 5-3)

a. Tune and load the KWM-2A at 3.700 MHz. Load to 230 mA plate current.

b. Set the PLATE-GRID-ALC control to GRID. Set VOX GAIN control maximum counterclockwise.

c. Set the EMISSION switch to TUNE.

d. Adjust the MIC GAIN control until the multimeter indicates about 1/2 scale.

e. Adjust both the top and bottom slugs in T1 (figure 5-6) to peak the multimeter indication. (Some models only have top slug.)

NOTE

The bottom slug in T1 may be adjusted to produce two peaks. Set the slug to the peak that occurs with the slug nearest the bottom of the can.

f. Adjust C54 (figure 5-6) to peak the multimeter indication. Set the EMISSION switch to LSB.

g. To align the bandpass if, proceed as follows:

WARNING

Turn off the KWM-2A power while connecting or disconnecting the swamping tool.

h. Connect the swamping tool (figure 5-2) from terminal 3 of T2 (figure 5-6) to ground.

i. Set the EMISSION switch to TUNE. Adjust MIC GAIN control to approximately midscale (keep grid current at midscale). Adjust the bottom slug (primary) of T2 (figure 5-7) for maximum multimeter indication. Set the EMISSION switch to LSB.

j. Reconnect the swamping tool from terminal 3 of T2 (figure 5-6) to terminal 2 of T2.

k. Adjust the top slug in T2 (figure 5-6) to peak the multimeter indication.

l. Disconnect the swamping tool from T2.

m. Retune and reload the KWM-2A at 3.655 MHz. After tuning, place PLATE-GRID-ALC control to GRID and MIC GAIN control to give 1/2-scale multimeter indication with EMISSION switch at TUNE.

n. Adjust L4 (figure 5-6) to peak the multimeter indication. This completes alignment of transmitter if circuits.

5-16. KWM-2A TRANSCEIVER RF CIRCUITS ALIGNMENT. (Test setup figure 5-3)

a. Tune and load the KWM-2A to the frequency listed in table 5-5.

b. Set the EMISSION switch to USB or LSB.

c. Set the PLATE-GRID-ALC control to GRID.

d. Set the MIC GAIN control to give 1/2-scale multimeter indication with 312B-4 FUNCTION switch set to TRANSMIT ONLY.

e. Refer to table 5-5 and figure 5-8. Adjust the components corresponding to the KWM-2A operating frequency to peak the multimeter indication. If necessary, readjust the MIC GAIN control during the peaking procedure to keep the multimeter indication below 1/2 scale.

Table 5-5. KWM-2A Transceiver, RF Circuits Alignment Table

KWM-2A OPERATING FREQUENCY (MHz)	ADJUST	
	SILKSCREEN	REF DESIG
3.700 (3.4 to 5.0)	(A) 3.8	C130 C109 C37 C70 L13 L10 T3 T4
7.150 (6.6 to 9.5)	(B) 7.0	C129 C113 C32 C63
14.150 (9.5 to 15.0)	(C) 14	C115 C34 C65 L14
21.300 (15.0 to 22.0)	(D) 21	C138 C116 C36 C67
28.600 (22.0 to 30.0)	(E) 28	C134 C111 C39 C68

NOTE

If the KWM-2A is to be operated outside an amateur band, repeak only the capacitors listed in table 5-5 for the particular operating frequency range given in parentheses in the KWM-2A OPERATING FREQUENCY column.

5-17. KWM-2A TRANSCEIVER FIRST TRANSMIT MIXER BALANCE ADJUSTMENT. (Test setup figure 5-3)

a. Tune and load the KWM-2A at 14.100 MHz. Load to 230 mA plate current.

b. When using the R-390A Receiver, set the EMISSION switch to USB or LSB.

c. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY.

d. Loosely couple a communications receiver to the KWM-2A rf output. Tune the receiver around 14.555 MHz until a signal is heard. (A frequency meter tuned to 14.555 MHz may be used in lieu of the R-390A Receiver.)

e. Adjust the 1ST MIX BAL adjustments (R24 and C21, figure 5-6) to null the receiver signal.

NOTE

R24 and C21 interact, so adjust first one, then the other, until neither adjustment causes a further null.

5-18. KWM-2A TRANSCEIVER LOADING CAPACITORS ADJUSTMENT. (Test setup figure 5-3)

a. Set the loading control to the 50 Ω mark.

b. Tune the KWM-2A to the first frequency listed in table 5-6. Leave the loading control set to 50 Ω.

Table 5-6. KWM-2A Transceiver, Loading Capacitors Adjustment

KWM-2A OPERATING FREQUENCY (MHz)	ADJUST
21.300	C155
28.600	C155
14.150	C152
7.150	C153
3.700	C154

c. Set the PLATE-GRID-ALC control to PLATE.

NOTE

If a capacitor is adjusted, readjust the P.A. TUNING control to dip the plate current. Adjust the capacitors for 230 mA plate current at the dip. C155 is adjusted at two frequencies. Adjust C155 for the best compromise between the two frequencies.

d. Set the EMISSION switch to LOCK.

e. Adjust the MIC GAIN control for maximum multimeter indication. This indication should be 230 mA with the loading control set to 50 Ω. If it is not, adjust the capacitor listed in table 5-6 for the proper indication.

f. Repeat procedure steps a through e for each of the other frequencies. Refer to figure 5-7 for the location of the adjustments. The relay cover must be removed to make the C153 adjustment.

5-19. KWM-2A TRANSCEIVER NEUTRALIZATION ADJUSTMENT (PA, DRIVER, AND FEEDBACK CIRCUITS).

a. Disconnect the KWM-2A power amplifier plate voltage by connecting the power connectors on the PM-2 or 516F-2 and KWM-2A with an extender cable that has the wire between pins 2 omitted.

b. Disconnect the KWM-2A power amplifier screen voltage by disconnecting the jumper wire (inside chassis) between the PA DISABLE jacks, J5 and J6, at the rear of the KWM-2A.

CAUTION

Do not operate the KWM-2A with the power amplifier plate voltage disconnected and screen voltage connected.

c. Set the KWM-2A to 28.600 MHz. Turn on the ac power.

d. Set the PLATE-GRID-ALC control to GRID.

e. Set the EMISSION switch to TUNE.

f. Set the MIC GAIN control fully clockwise.

g. Adjust EXCITER TUNING to peak the grid current, using the MIC GAIN control as necessary to keep the meter needle on scale.

h. Adjust the P.A. TUNING control to peak the KWM-2A rf output voltage. This voltage may be less than 0.5 volt rms.

i. Adjust C184 (figure 5-7) to null the KWM-2A rf output voltage. Set EMISSION switch to LSB.

j. Turn off ac power. Reconnect the jumper wire between the PA DISABLE jacks, J5 and J6, at the rear of the KWM-2A.

k. Connect the power connectors on the PM-2 or 516F-2 and KWM-2A with the normal extender cable.

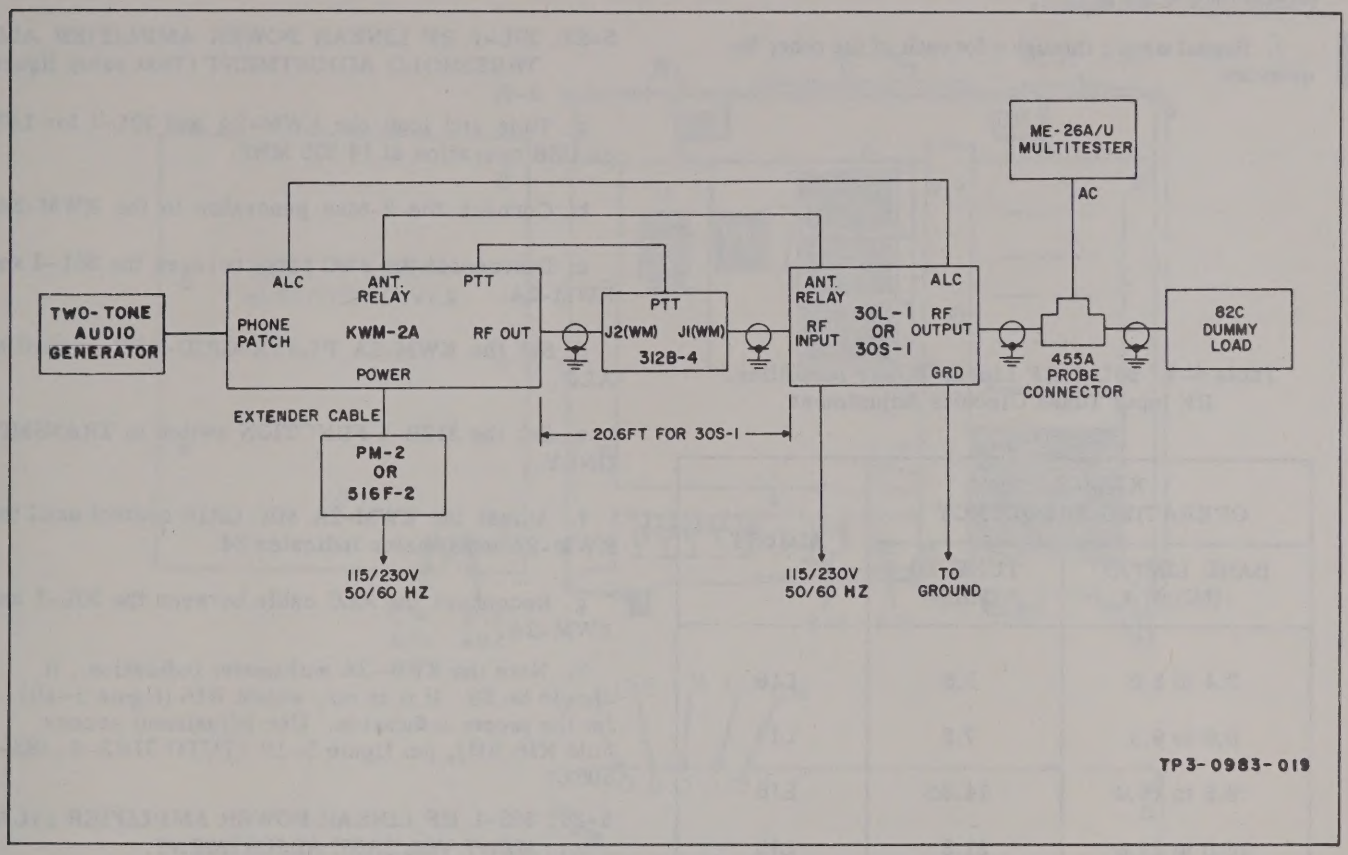

Figure 5-9. 30L-1/30S-1 RF Linear Power Amplifier, Test Setup

d. Set the OFF-ON-NB-CAL switch to CAL.

e. Adjust the CAL ADJ adjustment (C76, figure 5-6) for zero beat.

f. Set the EMISSION switch to LSB.

g. Zero beat the calibration signal at 3.400 MHz.

h. With the vfo tuning dial set as in step g, set the EMISSION switch to USB and adjust C308 (figure 5-6) for zero beat.

i. With the band switch set at the 3.4 MHz position, set the vfo tuning dial so that the 200 dial marking is zero beat with the calibration signal at 3.6 MHz. Adjust the hairline so that it is directly over the 200 dial marking.

j. With the hairline set as in step i, zero beat the calibration signal at 3.4 MHz. The zero beat should occur within ± 1 kHz of the 0 dial marking. If it does not, note the difference between the dial marking and the hairline (dial marking 1.5 kHz above hairline for example). Then without moving the hairline, adjust the vfo tuning dial to set the 0 dial marking an equal amount on the opposite side of the hairline (1.5 kHz below hairline). Adjust L302 for zero beat. If this adjustment is made, repeat this procedure starting with step i. If necessary, repeat until zero beat occurs within ± 1 kHz of the 0 dial setting.

k. Note the position of the dial hairline when the vfo is zero beat with the calibration signal. If the hairline is not nearly vertical, loosen the setscrews on the dial hub and move the dial (without moving the vfo shaft) until the hairline is vertical when the vfo is zero beat.

5-23. 30L-1 RF LINEAR POWER AMPLIFIER RF INPUT TUNED CIRCUITS ADJUSTMENT. (Test setup figure 5-9)

a. Tune KWM-2A and 30L-1 in normal manner to one of the frequencies listed in table 5-7.

b. With 30L-1 plate voltage on, set KWM-2A EMISSION switch to TUNE.

c. Adjust the KWM-2A MIC GAIN control until 312B-4 wattmeter indicates about 20 watts forward power.

d. Set 312B-4 wattmeter to REFLECTED 200.

e. Refer to table 5-7. Adjust the appropriate inductor to null the 312B-4 wattmeter indication. The location of the adjustment is shown in figure 5-10.

f. Repeat steps a through e for each of the other frequencies.

Table 5-7. 30L-1 RF Linear Power Amplifier, RF Input Tuned Circuits Adjustment

KWM-2A OPERATING FREQUENCY		ADJUST
BAND LIMITS (MHz)	TUNE TO (MHz)	
3.4 to 5.0	3.8	L18
6.6 to 9.5	7.2	L17
9.5 to 16.0	14.3	L16
16.0 to 22.0	21.3	L15
22.0 to 30.0	28.6	L14

5-24. 30L-1 RF LINEAR POWER AMPLIFIER TUNING-LOADING METER CIRCUIT ADJUSTMENT. (Test setup figure 5-9)

a. Tune and load the KWM-2A and 30L-1 at 14.3 MHz.

b. Set the 30L-1 METER switch to D.C. AMPS.

c. Set the KWM-2A EMISSION switch to LOCK.

CAUTION

Do not keep the 30L-1 plate current at 700 mA for longer than 30 seconds at one time.

d. Adjust the KWM-2A MIC GAIN control until the 30L-1 multimeter indicates 700 mA plate current.

e. Set the KWM-2A EMISSION switch to TUNE.

f. Set the 30L-1 METER switch to TUNE.

g. Note the 30L-1 multimeter indication. It should be zero. If it is not, adjust C18 (figure 5–10) for the proper indication. Use adjustment access hole C18 ADJ, per figure 5–10 (TCTO 31R2–4–183–506).

5-25. 30L-1 RF LINEAR POWER AMPLIFIER ALC THRESHOLD ADJUSTMENT (Test setup figure 5-9)

a. Tune and load the KWM-2A and 30L-1 for LSB or USB operation at 14.300 MHz.

b. Connect the 2-tone generator to the KWM-2A.

c. Disconnect the ALC cable between the 30L-1 and KWM-2A.

d. Set the KWM-2A PLATE-GRID-ALC control to ALC.

e. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY.

f. Adjust the KWM-2A MIC GAIN control until the KWM-2A multimeter indicates S4.

g. Reconnect the ALC cable between the 30L-1 and KWM-2A.

h. Note the KWM–2A multimeter indication. It should be S5. If it is not, adjust R16 (figure 5–10) for the proper indication. Use adjustment access hole R16 ADJ, per figure 5–10 (TCTO 31R2–4–183–506).

5-26. 30S-1 RF LINEAR POWER AMPLIFIER FILAMENT VOLTAGE ADJUSTMENT.

a. Set the POWER-OFF switch to POWER.

b. Set the multimeter selector to FILAMENT VOLTAGE.

c. Note the MULTIMETER indication. It should be 5.9 to 6.1 volts ac. If not, adjust the FIL VOLTAGE adjustment (R230, figure 5-11) for the 6.0 volts ac.

5-27. 30S-1 RF LINEAR POWER AMPLIFIER STATIC PLATE CURRENT ADJUSTMENT. (Test setup figure 5-9)

WARNING

In order to make this adjustment, a cover is removed that will activate an interlock. This will cause high-voltage circuits in the 30S-1 to be disabled while making the adjustment. It will be necessary to remove the cover, make a trial adjustment, replace the cover, and check for proper indications. If readjustment is required, repeat this procedure. Do not block the interlock while making the adjustment.

a. Set the POWER-OFF switch to POWER. Wait for 3 minutes.

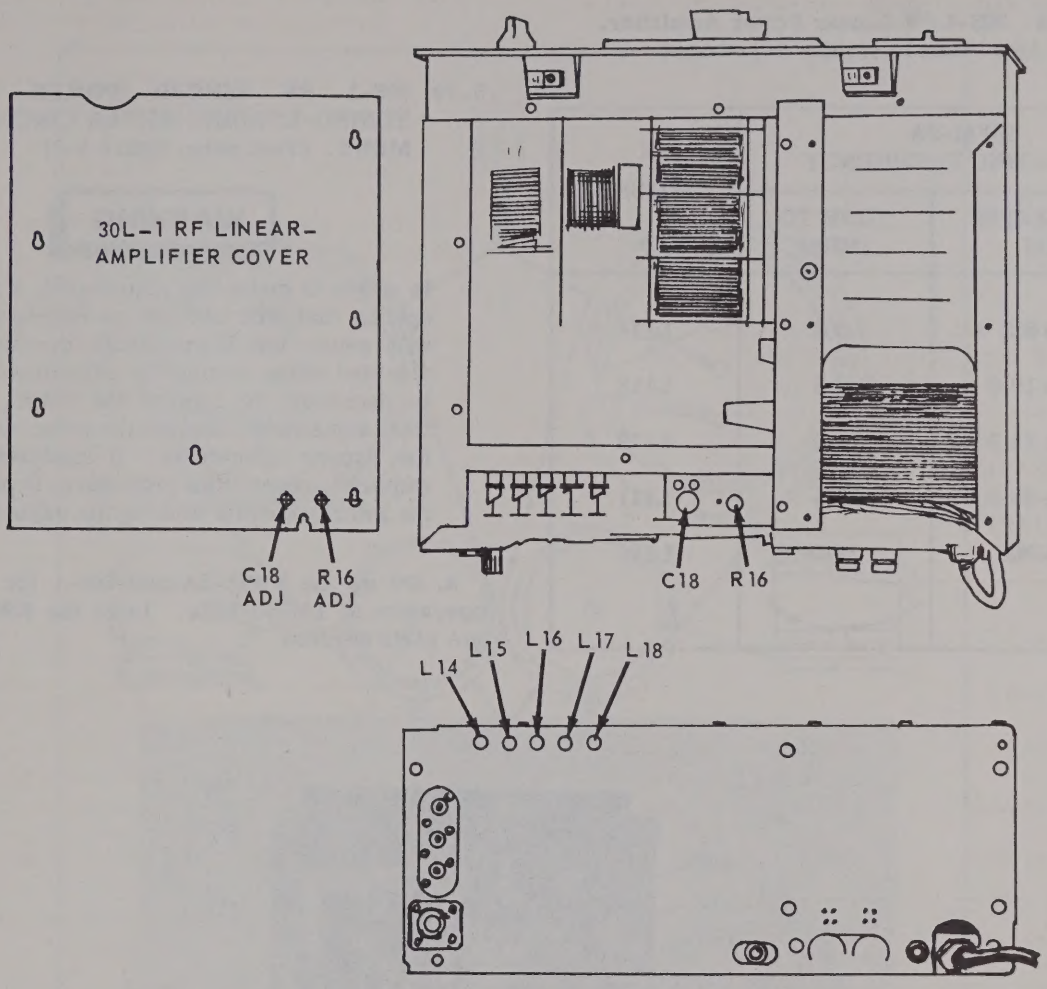

Figure 5-10. 30L-1 RF Linear Power Amplifier, Cover, and Adjustments

b. Set the KWM-2A MIC GAIN control to OFF.

c. Set the SSB-CW switch to SSB.

d. Press the ON switch.

e. Set the 312B-4 FUNCTION switch to TRANSMIT ONLY.

f. Note the PLATE CURRENT meter indication. It should be 0.19 to 0.21 ampere. If not, adjust the BIAS ADJUST adjustment (R219, figure 5-11) for the proper indication.

5-28. 30S-1 RF LINEAR POWER AMPLIFIER RF INPUT TUNED CIRCUITS ADJUSTMENT. (Test setup figure 5-9)

a. Tune the KWM-2A and 30S-1 in the normal manner to one of the frequencies listed in table 5-8.

b. With the 30S-1 plate voltage on, set the KWM-2A EMISSION switch to TUNE.

c. Adjust the KWM-2A MIC GAIN control until the 312B-4 wattmeter indicates about 20 watts forward power.

d. Set 312B-4 wattmeter selector switch to REFLECTED 200.

e. Refer to table 5-8. Adjust the appropriate inductor to null the 312B-4 wattmeter indicator. Refer to figure 5-11 for the location of the adjustment.

f. Repeat steps a through e for each of the frequencies.

Table 5-8. 30S-1 RF Linear Power Amplifier, RF Input Tuned Circuits Adjustment

KWM-2A OPERATING FREQUENCY		ADJUST
BAND LIMITS (MHz)	TUNE TO (MHz)	
3.4 to 5.0	3.8	L114
6.6 to 10.0	7.2	L113
10.0 to 15.0	14.3	L112
15.0 to 22.0	21.3	L111
22.0 to 30.0	28.6	L110

5-29. 30S-1 RF LINEAR POWER AMPLIFIER TUNING-LOADING METER CIRCUIT ADJUSTMENT. (Test setup figure 5-9)

WARNING

In order to make this adjustment, a cover is opened that will activate an interlock. This will cause the high-voltage circuits to be disabled while making the adjustment. It will be necessary to remove the cover, make a trial adjustment, replace the cover, and check for proper indications. If readjustment is required, repeat this procedure. Do not block the interlock while making the adjustment.

a. Set up the KWM-2A and 30S-1 for LSB or USB operation at 14.300 MHz. Load the KWM-2A to 200 mA plate current.

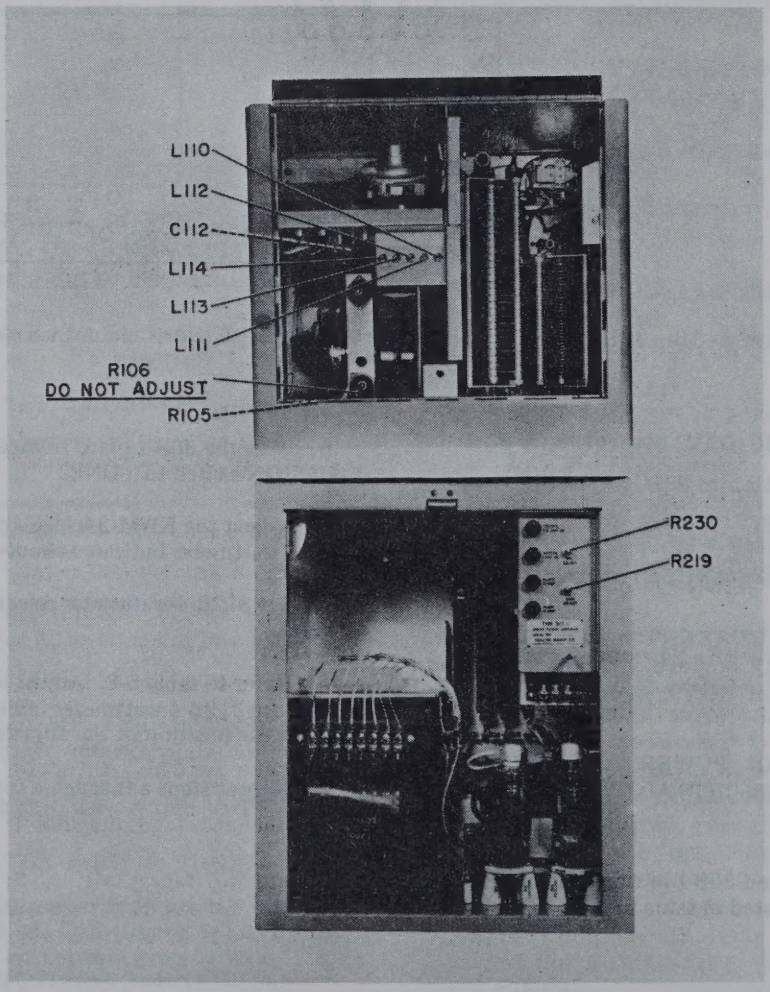

Figure 5-11. 30S-1 RF Linear Power Amplifier, Adjustments

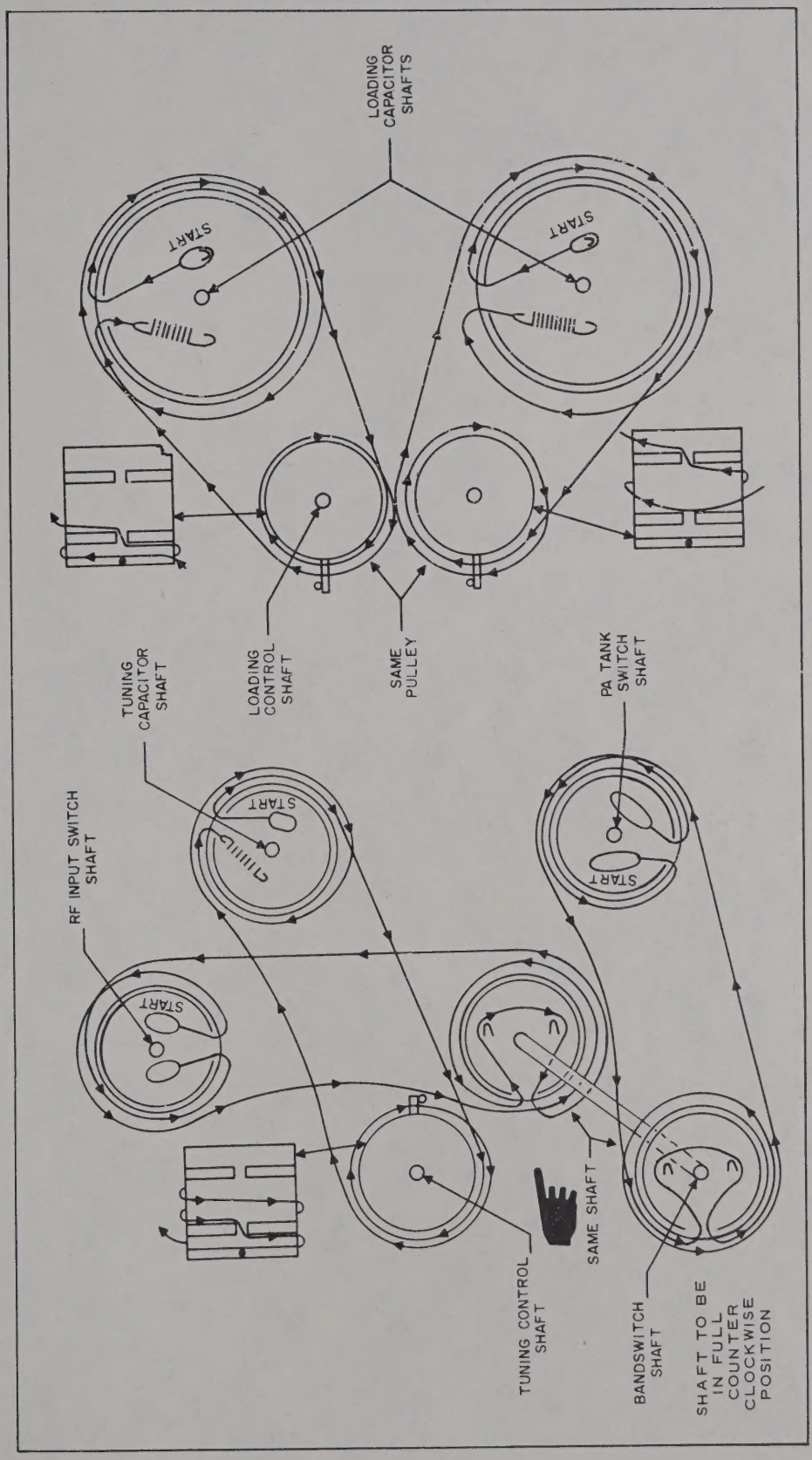

Figure 5-15. 30S-1 RF Linear Power Amplifier, Dial Cord Diagram